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The ignored of the soil: Current distribution and key to species of the introduced Old-World webspinners of the family Oligotomidae (Insecta, Embioptera) in Mexico

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Abstract

Specimens of webspinners (order Embioptera) of the family Oligotomidae from two biological collections in Mexico were examined (n = 431), revealing a greater state-level distribution than previously recorded for the three species of the genus *Oligotoma*. *Oligotoma humbertiana* is newly recorded for the states of Baja California Sur, Ciudad de México, Colima, Guerrero, Michoacán, Nayarit, Oaxaca, Sinaloa, Sonora, Veracruz, and Yucatán; *Oligotoma nigra* is newly recorded for Baja California Sur, Chihuahua, and Colima; and *Oligotoma saundersii* is newly recorded for Coahuila, Colima, Nayarit, Nuevo León, Oaxaca, Sonora, Veracruz, and Yucatán. An illustrated key that includes *Haploembia solieri* and the three aforementioned species of *Oligotoma* is proposed.

Keywords

Haploembia solieri, new records, *Oligotoma humbertiana*, *Oligotoma nigra*, *Oligotoma saundersii*, scientific collection

Introduction

Embioptera, commonly known as webspinners, is a polyneopteran order comprising approximately 400 described species, with global estimates suggesting that up to 2,000 species inhabit tropical and subtropical regions worldwide (Ross 1940, Ross 2000a). These cosmopolitan insects form a monophyletic group, that is well supported by a key synapomorphy: The foretarsi are notably enlarged compared to their middle and hind tarsi, and the first segment bears a silk-producing gland whose composition and structure is conserved during the evolution of the lineage over 100 million years ago (Miller et al. 2012, Torralba-Burial 2015, Edgerly 2018). Phylogenetic analyses (Whiting et al. 2003, Misof et al. 2014, Simon et al. 2019, Wipfler et al. 2019) and morphological studies (Wipfler et al. 2011, Friedemann et al. 2012, Matsumura et al. 2015) support Phasmatodea and Embioptera as sister clades within the Eukinolabia.

The Embioptera body shape is elongate and relatively small (Figs 1–3), reaching an average size of 10 mm (Torralba-Burial 2015). Nymphs and females are wingless, while males are usually winged, except in some species (Szumik 2002, Poolprasert and Edgerly 2011, Miller et al. 2012). Wing venation pattern and the external male genitalia (terminalia) are useful for the diagnosis and identification of families, genera, and species of this order (Miller et al. 2012). Due to their small size and cryptic habitats, they are considered difficult to collect; this results in their poor representation in entomological collections (Miller et al. 2012).

Webspinners exhibit gregarious and subsocial behavior, residing in silken galleries constructed by both nymphs and adults where they live, feed, and reproduce (Ross 2000b). Native species contribute to soil function in several ways, such as through organic matter decomposition and nutrient redistribution (soil-dwelling and primarily feeding on plant debris), soil aeration (their burrowing and silk gallery construction), improved soil structure (enhancing aeration and water infiltration), and microhabitat creation (silk galleries provide shelter for microorganisms and small invertebrates, promoting biodiversity) (Potapov et al. 2022). While the ecological impact of introduced Embioptera is not well studied, they may compete with native detritivores for food, alter soil structure through silk gallery construction, and influence food webs by serving as prey for insectivores. Some species, like *Oligotoma saundersii*, have successfully established populations worldwide, demonstrating their adaptability and potential for expansion (Nozaki et al. 2018, Curtiss et al. 2022, Edgerly 2022).

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Mexico is home to five families of webspinners: Anisembiidae, Archembiidae, Clothodidae, Teratembiidae, and Oligotomidae. The latter family is represented by two genera of introduced species, including *Haploembia solieri* (Rambur, 1842), found in Baja California (Mariño and Márquez 1983, Ross 1984a); *Oligotoma humbertiana* (Saussure, 1896), recorded in central and southwestern Mexico (Mariño and Márquez 1982); *Oligotoma nigra* Hagen, 1885, found in northwestern Mexico (Ross 1957, 1966, 1984a); and *Oligotoma saundersii* (Westwood, 1837), sporadically recorded in both northern and southern Mexico (Ross 1984a). A phylogenetic analysis of Oligotomidae supported the Asian origin of *Oligotoma* Westwood, 1837 and *Haploembia* Verhoeff, 1904 (Chen et al. 2017). The study of webspinners in Mexico is limited mainly due to the lack of interest among entomologists, as this group is not medically important and has less commercial importance (Argaman and Mendel 1991, Ross 2000b); also, given their apparent scarcity, their presence is assumed to have a limited ecological impact in any given habitat.

The purpose of this article is to provide a much-needed update of the family Oligotomidae in Mexico by compiling all the records in the literature and reviewing the specimens kept in two of the main national insect collections; new distributional data at the state level are documented. A key to the introduced Oligotomidae found in Mexico is also proposed.

Materials and methods

A total of 431 webspinner specimens were examined. These were preserved in ethanol and are held in two biological collections: the Colección Nacional de Insectos of the Instituto de Biología of the Universidad Nacional Autónoma de México (CNIN-UNAM) and the Entomology Laboratory of the Facultad de Ciencias Forestales (FCF) of the Universidad Autónoma de Nuevo León (UANL). All specimens were initially sexed based on the presence (males) or absence (females and nymphs) of wings. Wingless individuals were then re-examined to determine the shape of the terminalia and identify potential wingless males. After that, all adult specimens were identified to the family level following Miller et al. (2012), and then the 166 individuals belonging to the family Oligotomidae were subsequently identified to the species level using specialized literature (Mariño and Márquez 1983, Ross 1984b, Poolprasert 2012). For the examination and identification of the specimens, the genitalia were observed using dissection tools (forceps and dissection needles for specimen handling) and a stereoscope (KOPPACE KP-0850P-B1-4010) at a magnification of 10×. Anatomical terminology (male terminalia and female sternites) follows Ross (2000a) and Poolprasert (2012). Images of relevant morphological aspects (Figs 1–3) of the specimens examined were obtained using another stereomicroscope (ZEISS AXIO Zoom.V16) with an adapted camera (AxioCam MRc5) for multifocal photography; ventral and dorsal views of the head, thorax, abdomen, and genitalia were taken in layers that were subsequently stacked using the ZEN 2012 program (blue edition).

Taxonomy

Embioptera Lameere, 1900

Oligotomidae Enderlein, 1909

Differential diagnosis.—Wing vein media anterior (MA) single branched, unlike in Archembiidae, Clothodidae, and Teratembiidae where it is bifid. Male mandibles have either two teeth on each mandible (*Haploembia*) or three on the left and two on the right (*Oligotoma*); this differs from Anisembiidae in which at least one mandible has a single tooth or both may have one (Szumik 2002, Miller et al. 2012, Szumik et al. 2024). The details of the morphological characteristics of the adults are indicated in Figs 1A–F, 2A–F, 3A–F.

Haploembia Verhoeff, 1904

Differential diagnosis.—Males of *Haploembia* are wingless, while those of *Oligotoma* possess wings (Figs 1A, 2A, 3A). In *Haploembia*, each mandible has two apical teeth, while in *Oligotoma*, the left mandible has three teeth and the right one has two (Figs 1B, 2B, 3D). In *Haploembia*, there are two ventral papillae in each hind basitarsus; there is only one in each in *Oligotoma* (Figs 1E, 2E, 3E) (Poolprasert 2012).

Haploembia solieri (Rambur, 1842)

Differential diagnosis.—Same as the genus. This is the only species of *Haploembia* recorded in the Western Hemisphere.

State distribution in Mexico.—Baja California (Ross 1957, 1984a, Mariño and Márquez 1983).

Oligotoma Westwood, 1837

Differential diagnosis.—Males of *Oligotoma* are winged (Figs 1A, 2A, 3A), while those of *Haploembia* are wingless. *Oligotoma* differs further in that the left mandible has three apical teeth while the right mandible has two (Figs 1B, 2B, 3D); in *Haploembia*, each mandible has two apical teeth. Finally, the number of ventral papillae in the posterior basitarsi is different between these genera: *Oligotoma* has one in each hind basitarsus (Figs 1E, 2E, 3E), while *Haploembia* has two (Poolprasert 2012).

Oligotoma humbertiana (Saussure, 1896)
Figs 1A–F, 4A, B, 6

Differential diagnosis.—(Poolprasert 2012). Males with subapical spines present on the exterior side of the process of the right hemiterguite (Fig. 4A); in comparison, males of *O. saundersii* and *O. nigra* have this process without subapical spines. The basipodite of the left cercus has a prominent internal lobe (Fig. 4A, B); those of *O. saundersii* have one that is well-developed and curved toward the exterior, and those of *O. nigra* have a hook-like process. Females have sternite VIII divided with an unpigmented spot at the center and on both lateral sides with a pattern consisting of two unpigmented narrow convergent lines; this differs from *O. saundersii* in which sternite VIII is divided with two caudally convergent lines. Sternite VIII of *O. nigra* has two broad lateral pigmented areas separated by an almost unpigmented area, sternite IX without distinct pattern, while *O. saundersii* females show an arrow pattern in sternite IX, and those of *O. nigra* exhibit deeply inset sternite IX. The head is longer than broad; this is unlike females of *O. nigra*, which have squared heads (Poolprasert 2012).

Material examined.—(82 males) MEXICO, **Baja California sur** • 1♂; Loreto, Mision San Fco. Javier de Viggé-Biaundó, Arroyo San Javier; 25°51.347'N, 111°33.005'W; 393 m a.s.l.; 11 Aug. 2021; Luna, Contreras, Barba, Ramirez leg.; Xerophilous Scrub; Light trap; CNIN • 1♂; Mulegé; 14 Aug. 1981; E. Barrera leg.; Xerophilous Scrub; CNIN • 3♂; Santa Rosalia Mulege, Heroica Mulege; 26°53'30"N, 111°58'51"W; 10 m a.s.l.; 10 Oct. 2010; C. Mayorga, L. Cervantes

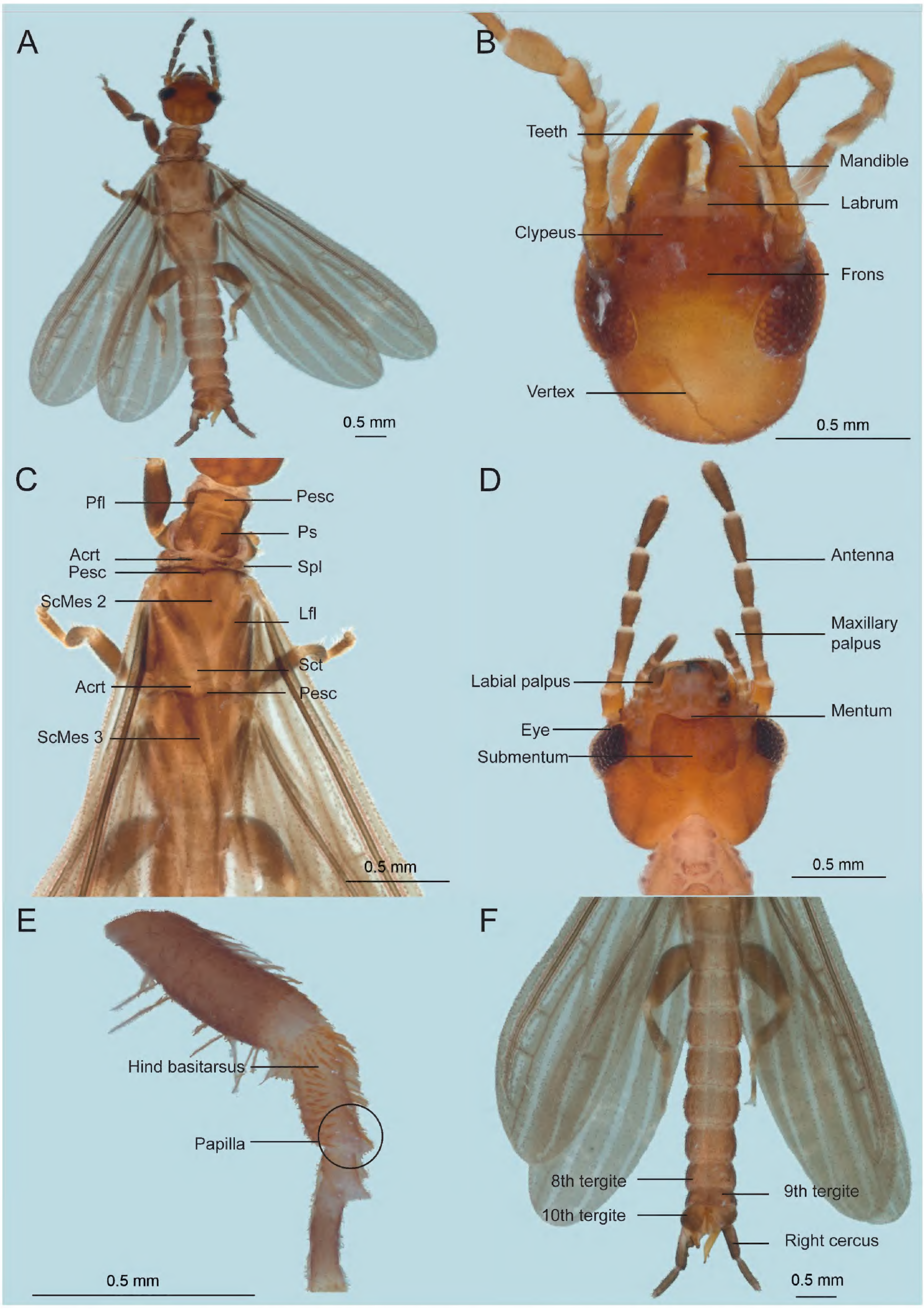

Fig. 1. *Oligotoma humbertiana*, male (♂). **A.** Dorsal habitus. **B.** Ventral aspect of head. **C.** Dorsal aspect of thorax. **D.** Dorsal aspect of head. **E.** Ventral aspect of hindtarsi. **F.** Dorsal aspect of abdomen. Acrt: Acrotergite, Lfl: Lateral flange, Pesc: Prescutum, Pfl: Pronotal flange, Ps: Pronotum scutum, Scl: Scutellum, ScMes 2: Scutum 2 Mesonotum, ScMes 3: Scutum 3 Metanotum, Spl: Spiracular lobe.

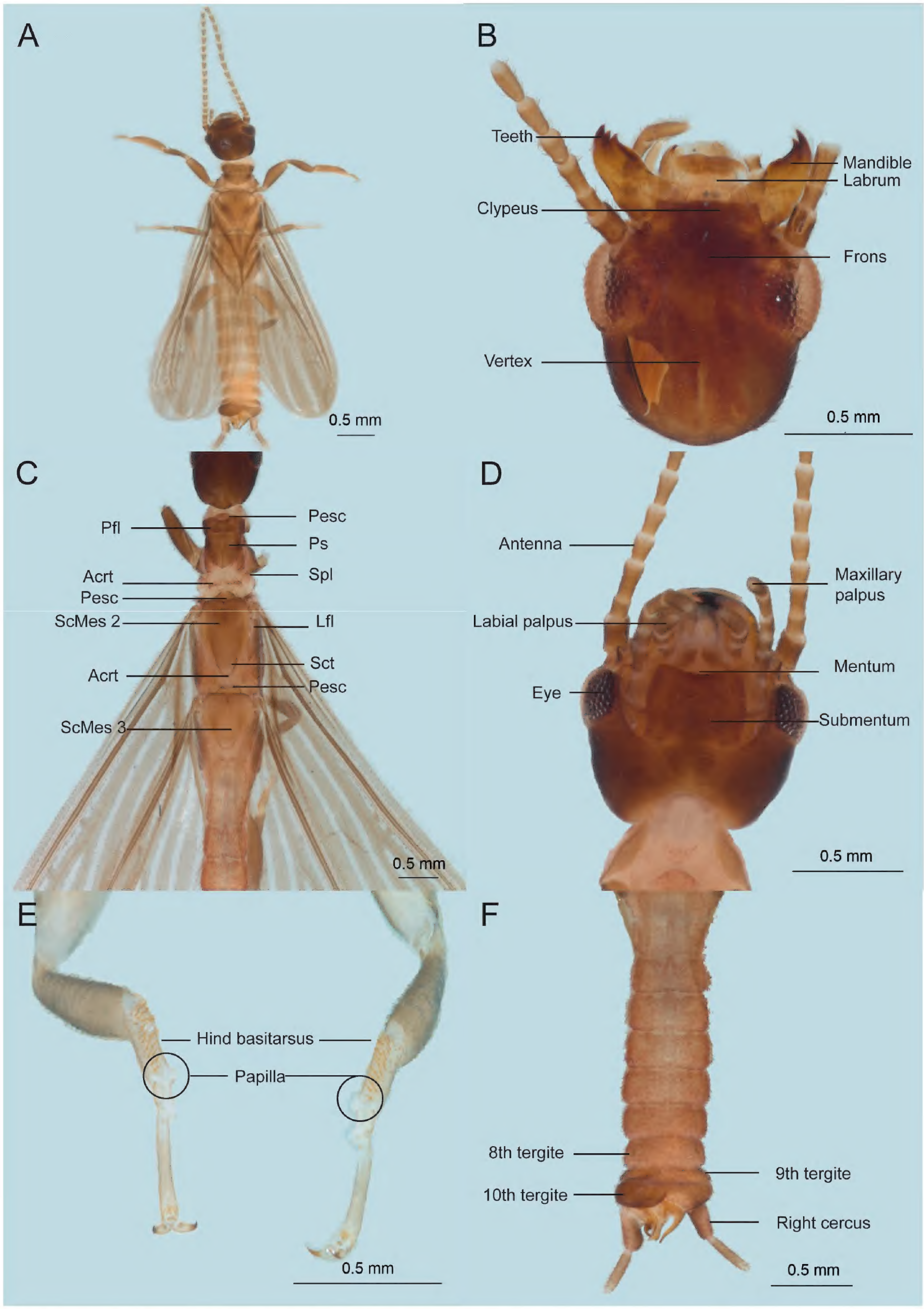

Fig. 2. *Oligotoma nigra*, male (♂). **A.** Dorsal habitus. **B.** Ventral aspect of head. **C.** Dorsal aspect of thorax. **D.** Dorsal aspect of head. **E.** Ventral aspect of hindtarsi. **F.** Dorsal aspect of abdomen. Acrt: Acrotergite, Lfl: Lateral flange, Pesc: Prescutum, Pfl: Pronotal flange, Ps: Pronotum scutum, Scl: Scutellum, ScMes 2: Scutum 2 Mesonotum, ScMes 3: Scutum 3 Metanotum, Spl: Spiracular lobe.

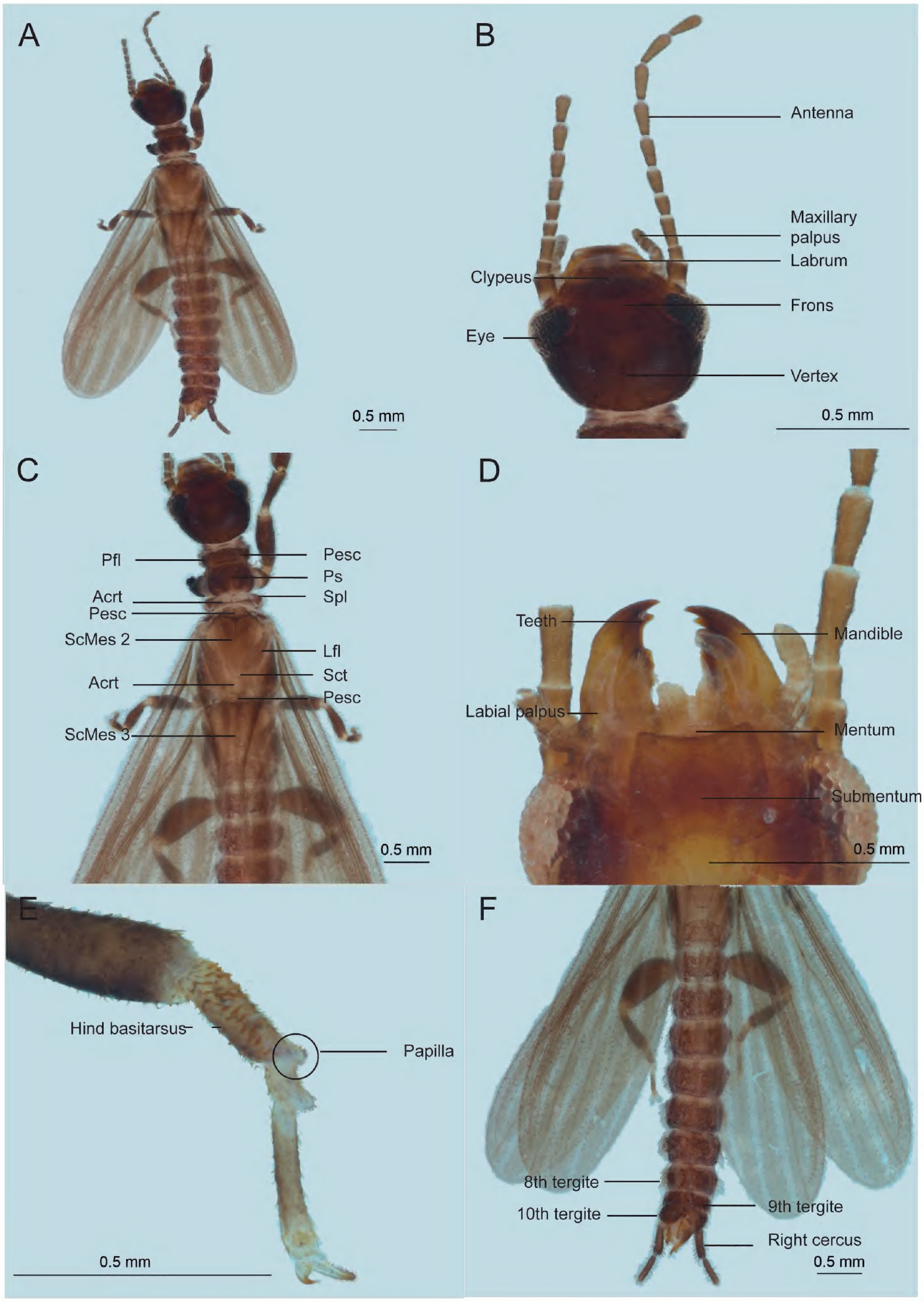

Fig. 3. *Oligotoma saundersii*, Male (♂). **A.** Dorsal habitus. **B.** Ventral aspect of head. **C.** Dorsal aspect of thorax. **D.** Dorsal aspect of head. **E.** Ventral aspect of hindtarsi. **F.** Dorsal aspect of abdomen. Acrt: Acrotergite, Lfl: Lateral flange, Pesc: Prescutum, Pfl: Pronotal flange, Ps: Pronotum scutum, Scl: Scutellum, ScMes 2: Scutum 2 Mesonotum, ScMes 3: Scutum 3 Metanotum, Spl: Spiracular lobe.

leg.; Xerophilous Scrub; Light trap; CNIN • 1♂; Santa Rosalia Mulegé, Heroica Mulegé; 26°53'30"N, 111°58'51"W; 26 Nov. 1998; Balcazar, Ibarra leg.; Xerophilous Scrub; CNIN • 1♂; Santa Rosalia Mulegé, Heroica Mulegé; 26°53'30"N, 111°58'51"W; 26 Nov. 1999; Balcazar, Ibarra leg.; Xerophilous Scrub; CNIN. **Ciudad de México** • 1♂; Xochimilco; 26 Dec. 2002; H. Barrera R. leg.; CNIN. **Colima** • 1♂; Isla Socorro, La Huerta; 21 Dec. 1987; L. Cervantes leg.; CNIN • 7♂; Isla Socorro, La Huerta; 5 Oct. 1988; A. Cadena, L. Cervantes, M. García leg.; Light trap; CNIN • 2♂; Isla Socorro, 50 m a.s.l.; 10 Aug. 1987; E. Barrera leg.; CNIN • 1♂; Isla Socorro, 23 Aug 1987; L. Cervantes, R. Medina leg.; CNIN • 2♂; Tecoma, 11 Feb. 1983; H. Brailovsky, E Barrera leg.; CNIN. **Guerrero** • 1♂; Acapulco de Juarez, Acapulco; 01 Mar. 1980; H. Brailovsky leg.; CNIN • 1♂; Altamirano; 21 Oct. 1993; H. Brailovsky, E Barrera leg.; CNIN • 1♂; Chilpancingo, Hotel del Marquéz; 17°31'01"N, 99°28'51"W; 1191 m a.s.l.; 24 Apr. 2006; H. Brailovsky, L.Cervantes leg.; CNIN • 2♂; Coahuaxutla, 581 m; 18°09'41"N, 101°45'20"W; 58 m a.s.l.; 21 Jul. 2004; L. Cervantes, J. Calonico leg.; CNIN • 1♂; Zihuatanejo; 08 Jun. 1984; C. Marquez M. leg.; CNIN. **Jalisco** • 2♂; Puerto Vallarta, Jardin Botanico Sitio 3; 20°28.033'N, 105°17.617'W; 341 m a.s.l; 17 Oct. 2018; Contreras, Gómez, Marquez, Rivera, Zurita leg.; riparian vegetation; entomological net; CNIN • 2♂; San Andrés Ixtlan; [illegible date]; E. Barrera, H. Brailovsky leg.; CNIN. **Michoacán** • 3♂; Apatzingan; 05 May. 1983; H. Brailovsky leg.; CNIN. **Morelos** • 3♂; Zacatepec; 18 Jun. 1991; light trap; CNIN • 4♂; Zacatepec; Mar. 1990; attracted to white light (office), flying erratic, 20:10 hrs; CNIN • 2♂; Zacatepec; 12 Jun. 1988; J. Gtz leg.; CNIN • 1♂; Zacatepec, CIFAP, Morelos; 03 Jun. 1989; J. Gutierrez leg.; light trap; CNIN. **Nayarit** • 1♂; Aguamilpa, San Rafael, Arroyo de la Virgen; 01 Nov. 1991; R. Barba, E. Barrera leg.; CNIN • 1♂; Bahía de Banderas, Bucerias, Lazaro Cárdenaa No. 56; 20.753991°N, 105.336729°W; 10 m a.s.l.; 31 Jul. to 02 Aug. 2018; A. Gómez leg.; light trap; CNIN • 4♂; Bahía

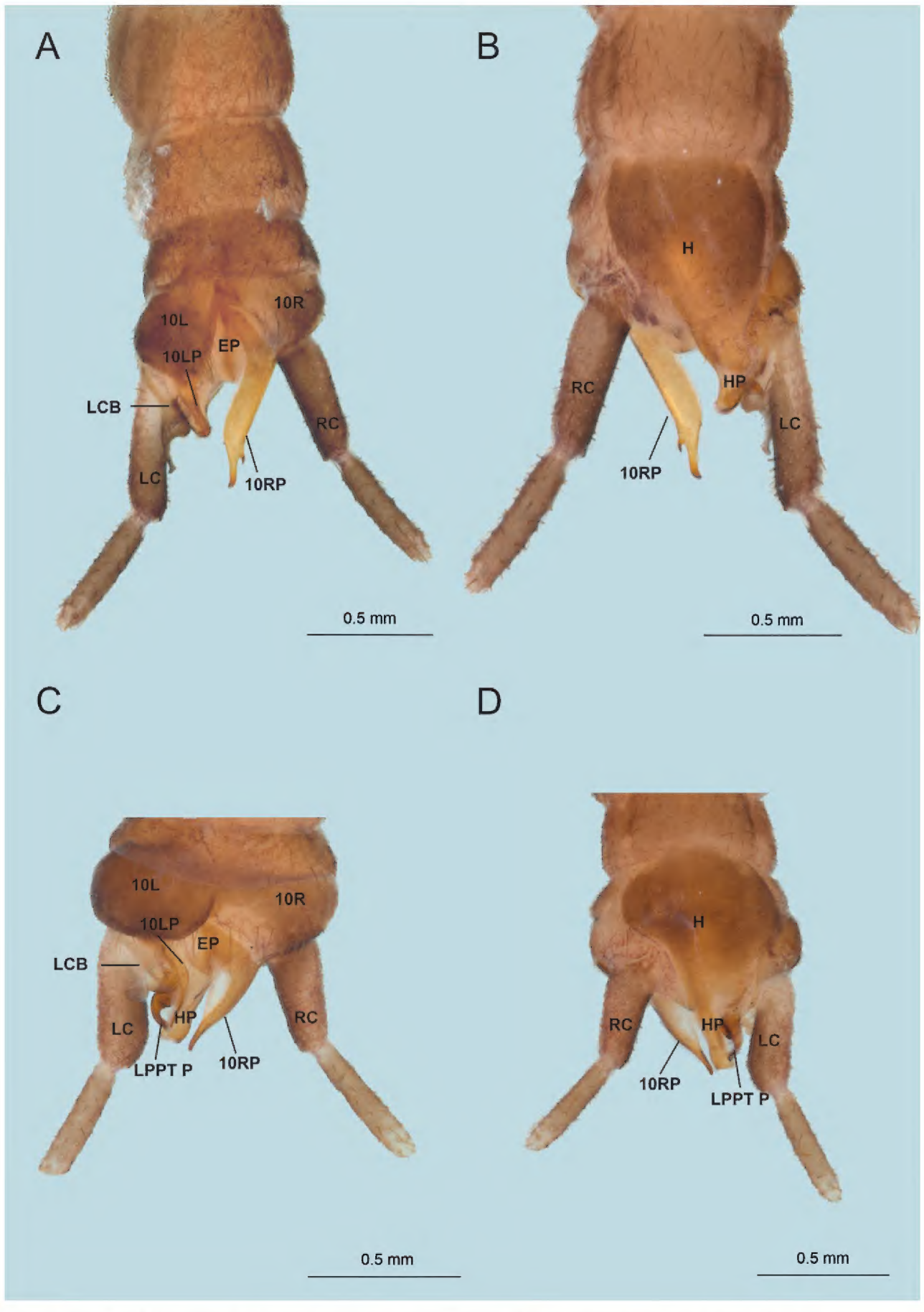

Fig. 4. Diagnostic characters of males *Oligotoma humbertiana* (**A, B**) and *O. nigra* (**C, D**). **A–C.** Dorsal views of terminalia. **B–D.** Ventral views of terminalia. 10L: left hemitergite, 10LP: Process of left hemitergite, 10R: right hemitergite, 10RP: Process of right hemitergite, EP: Epiproct, H: hypoandrium, HP: Process of Hypandrium, LC: left cercus, LCB: left cercus basipodite, LPPT P: Process of left paraproct, RC: right cercus.

de Banderas, Bucerias, Lazaro Cárdenaa No. 56; 20.753991°N, 105.336729°W; 10 m a.s.l.; 16–17 Oct. 2018; A. Gómez leg.; light trap; CNIN • 5♂; Isla Maria Madre; 12 Dec. 1986; V. Melendez, L. Cervantes, R. Barba leg.; CNIN • 1♂; Las Adjuntas Rio Huaynamota; 28 Nov. 1991; R. Barba, E. Barrera leg.; CNIN • 1♂; Rio Santiago, Playa de Golondrinas; 26 May. 1991; R. Barba, E. Barrera leg.; CNIN • 7♂; Tepic, Rio Santiago Colorado de la Mora; 30 Nov. 1991; R. Barba, E. Barrera leg.; CNIN • 2♂; Tepic; Rio Santiago Colorado de la Mora; 13 Feb. 1991; E. Barrera, R. Barba leg.; CNIN • 1♂; Tepic; Rio Santiago Colorado de la Mora; 30 Nov. 1991; R. Barba, E. Barrera leg.; CNIN • 1♂; Tepic; Rio Santiago Colorado de la Mora; 14 Jul. 1991; R. Barba, E. Barrera leg.; CNIN • 2♂; Tepic; 07 Jul. 1982; H. Brailovsky, E. Barrera leg.; CNIN. **Oaxaca** • 1♂; Puerto Escondido, Restaurante "El Cafesito"; 15.8614°N, -97.0782°W; 10 m a.s.l.; 29 Dec. 2019; A. Gómez leg.; light trap; CNIN • 1♂; Santiago Pinotepa Nacional, Cerca de Pinotepa Nacional carr. 200; 16.37195°N, -98.177102°W; 216 m a.s.l.; 08 Nov. 2018; A. Zaldivar et al. leg.; light trap; CNIN. **Sinaloa** • 1♂; Culiacán; 09 Nov. 1986; E. Mariño leg.; CNIN. **Sonora** • 1♂; Bacúm, San José Bacúm, Colonia Centro; 27.5151°N, -110.1430°W; 16 Feb. 2024; K. Reynaga leg. **Veracruz** • 1♂; Cordoba, Cuauhtemoc; 01 Feb. to 06 Mar. 2011; L. Delgado leg.;interception trap; CNIN. **Yucatán** • 7♂; Mérida, Parque Ecológico Yucalpeten, 12 Aug. 2023; E. Barrera leg.; CNIN.

State distribution in Mexico.—Baja California Sur (new record), Ciudad de México (new record), Colima (new record), Guerrero (Mariño and Márquez 1982), Jalisco (Mariño and Márquez 1982), Michoacán (new record), Morelos (new record), Nayarit (new record), Oaxaca (new record), Puebla (Mariño and Márquez 1982), Sinaloa (new record), Sonora (new record), Veracruz (new record), and Yucatán (new record) (Fig. 6).

Oligotoma nigra **Hagen, 1885**
Figs 2A–F, 4C, D, 5C, 6

Differential diagnosis.—(Poolprasert 2012). Males have a hook-shaped process that arises from the basipodite of the left cercus (Fig. 2C), those of *O. saundersii* have a sickle-shaped spine in the left epiproct, and those of *O. humbertiana* have a prominent internal lobe. The hypandrium extends into an elongated and distally truncated process (Fig. 2D); in *O. saundersii* and *O. humbertiana*, this structure does not possess said elongation. Females of *O. nigra* have a squared head; in comparison, those of *O. saundersii* and *O. humbertiana* have their head longer than broad. The sternite VIII has two indefinably outlined, broad, round, lateral, pigmented areas separated medially by almost unpigmented areas (Fig. 5C); those of *O. saundersii* have the sternite VIII with two narrow caudally convergent lines; in comparison, females of *O. humbertiana* have the sternite VIII divided with an unpigmented spot at the center and on both lateral sides with a pattern consisting of two unpigmented narrow convergent lines. Sternite IX is deeply inset into segment (Fig. 5C), while those of *O. saundersii* have an arrow pattern in the sternite IX and those of *O. humbertiana* do not exhibit a distinct pattern in the sternite IX.

Material examined.—(25 males, 8 females) MEXICO – **Baja California** • 2♂; Ensenada, Carr. 1 Hotel Mision Cataviña, predio detrás; 29°43.626'N, 114°43.194'W; 558 m a.s.l.; 07 Aug. 2021; Contreras, Cancino, Luna, Martins, Marquez leg.; Xerophilous Scrub; Light trap; CNIN. **Baja California Sur** • 3♂; Loreto, Mision San Fco. Javier de Viggé-Biaundó, Arroyo San Javier; 25°51.347'N, 111°33.005'W; 393 m a.s.l.; 11 Aug. 2021; Luna, Contreras, Barba, Ramirez leg.; Xerophilous Scrub; Light trap; CNIN • 6♂; Loreto, Mision San Fco. Javier de Viggé-Biaundó, Arroyo San Javier (Pozas); 25°51.347'N, 111°33.005'W; 393 m a.s.l.; 07 Jul. 2002; A. Contreras, A. Gómez, Y. Marquez, A. Ramirez, M. Ramirez leg.; Xerophilous Scrub; Light trap; CNIN • 10♂; Mulegé, San Bruno, Hotel Costa Ser'ena, terreno aledaño; 27°09.832'N, 112°09.895'W; 6 m a.s.l.; 09 Aug. 2021; Contreras, Cancino, Luna, Martins, Marquez leg.; Xerophilous Scrub; Light trap; CNIN • 3♂; Santa Rosalía Mulegé, Heroica Mulegé; 26°53'30"N, 111°58'51"W; 10 m a.s.l.; 10 Oct. 2010; C. Mayorga, L. Cervantes leg.; Xerophilous Scrub; Light trap; CNIN. **Chihuahua** • 1♂; Ciudad Juarez; 15 Jul. 1985; H. Brailovsky, E. Barrera leg.; Xerophilous Scrub; CNIN. **Colima** •8 ♀; Isla Socorro, 50 m a.s.l.; 10 Aug. 1987; E. Barrera leg.; CNIN.

Distribution in Mexico.—Baja California (Ross 1957, 1966), Baja California Sur (new record), Chihuahua (new record), and Colima (new record) (Fig. 6).

Oligotoma saundersii **(Westwood, 1837)**
Figs 3A–F, 5A, B, D, 6

Differential diagnosis.—Males possess a very notorious and sickle-shaped widened spine in the left epiproct (Fig. 5A, B), unlike those of *O. nigra* and *O. humbertiana* in which the spine is inconspicuous. The basipodite of the left cercus is well-developed and curved toward the exterior (Fig. 5A, B), while those of *O. humbertiana* have a prominent internal lobe and those of *O. nigra* have a hook-shaped process that arises from it. The process of the right hemiterguite is spatulated, and its sides are curved (Fig. 5A, B), unlike males of *O. humbertiana*, which exhibit subapical spines present on the exterior side of it, and those of *Oligotoma nigra*, which display a large, slightly curved process of the right hemiterguite. Females of *O. saundersii* have their head longer than broad, unlike those of *O. nigra*, which have a squared head. Sternite VIII is divided by two narrow, caudally convergent membranous lines (Fig. 5D); those of *O. nigra* have a sternite VIII with two indefinably outlined, broad, round, lateral, pigmented areas separated medially by almost unpigmented areas, and those of *O. humbertiana* have sternite VIII divided with an unpigmented spot at the center and on both lateral sides with a pattern consisting of two unpigmented narrow convergent lines. Sternite IX is arrow shaped (Fig. 5D); sternite IX of *O. nigra* is deeply inset into the segment, and in *O. humbertiana*, sternite IX does not have any distinct pattern.

Material examined.—(44 males, 7 females) MEXICO, **Coahuila** • 3♂; Saltillo, CC El Cañon; 06 Sep. 2010; A. Zaldivar leg.; Xerophilous Scrub; Yellow pan trap; CNIN. **Colima** • 1♂; Isla Socorro, La huerta; 05 Oct. 1988; A. Cadena, L. Cervantes, M. García leg.; light trap; CNIN • 2♂; Tecomán; 11 Feb. 1982; H. Brailovsky, E. barrera leg.; CNIN. **Nayarit** • 1♂; Bahía de Banderas, Bucerias, Lazaro Cárdenas No. 56; 20.753991°N, 105.336729°W; 10 m a.s.l.; 16–17 Oct. 2018; A. Gómez leg.; Light trap; CNIN. **Nuevo León** • 1♂; Santa Catarina, Col. Sombrillas, Zona Urbana; 15 Nov. 2021; M. de Luna leg.; FCF-UANL • 1♂; Guadalupe, Rio La Silla; 10 Oct. 2023; J. Velázquez leg.; FCF-UANL • 28♂; Santa Catarina, Col. Centro; 25.7279°N, -100.3078°W; 02 Sep. 2017; M. de Luna leg.; FCF-UANL. **Oaxaca** • 1♂; San Juan Bautista Tuxtepec, Km 17 Carr. Tuxtepec-Presa Cerro de Oro; 23 May. 1990; A. Cadena, E. Barrera leg.; CNIN. **Sonora** • 1♂; Bacúm, San José Bacúm, Colonia Centro; 27.5151°N, -110.1430°W; 16 Feb. 2024; K. Reynaga leg. **Veracruz** • 2♂; Tuxpan; 16 May. 2012; H. Brailovsky, E. Barrera leg.; CNIN. **Yucatán** • 2♂, 7 ♀; Mérida, Parque Ecologico Yucalpeten; 12 Aug. 2023; E. Barrera leg.; CNIN • 1♂; Puerto Morelos, Puerto Morelos; Aug. 1986; Litter; CNIN.

State distribution in Mexico.—Campeche (Mariño and Márquez 1982), Coahuila (new record), Colima (new record), Nayarit (new record), Nuevo León (new record), Oaxaca (new record), Puebla (Mariño and Márquez 1982), Sonora (new record), Veracruz (new record), and Yucatán (new record) (Fig. 6).

Key to the species Oligotomidae recorded in Mexico.—

1 Both sexes wingless (♂♀);mandible in both sexes with two teeth (♂♀); posterior basitarsi with two ventral papillae each (♂♀) ..... *Haploembia solieri*

– Males winged, females wingless; left mandible with three teeth, right with two (♂♀) (Figs 1B, 2B, 3D); posterior basitarsi with a single ventral papilla each (♂♀) (Figs 1E, 2E, 3E) **2**

2 Right tergal process with subapical spines on outer edge (♂) (Fig. 4A, B); head longer than broad (♀); sternite VII divided with a central unpigmented spot and two narrow convergent lines on the sides (♀); sternite IX lacks a distinct pattern (♀) (Poolprasert, 2012) ..... *Oligotoma humbertiana*

– Right tergal process without subapical spines (♂) (Figs 4C, 5A); head longer than broad or squared (♀); sternite VIII not divided with a central unpigmented spot and lacks convergent lines (♀) (Fig. 5C, D); sternite IX with distinct pattern (♀) **3**

3 Left cercus basipodite with a hook-shaped process directed ventrally (♂) (Fig. 4C); hypandrium with elongated, distally truncated projection (♂) (Fig. 4D); left paraproct spine inconspicuous (♂) (Fig. 4D); head squared (♀); sternite VIII with two broad, lateral pigmented areas separated by unpigmented median space (♀); sternite IX deeply inset (Fig. 5C) ..... *Oligotoma nigra*

– Left cercus basipodite curved outward (♂) (Fig. 5A); hypandrium distally widened with hook-shaped apex (♂) (Fig. 3H); left paraproct spine prominent, sickle-shaped (♂) (Fig. 5A, B); sternite VIII divided medially with two narrow caudally convergent lines (♀) (Fig. 5D); sternite IX arrow headed (♀) ..... *Oligotoma saundersii*

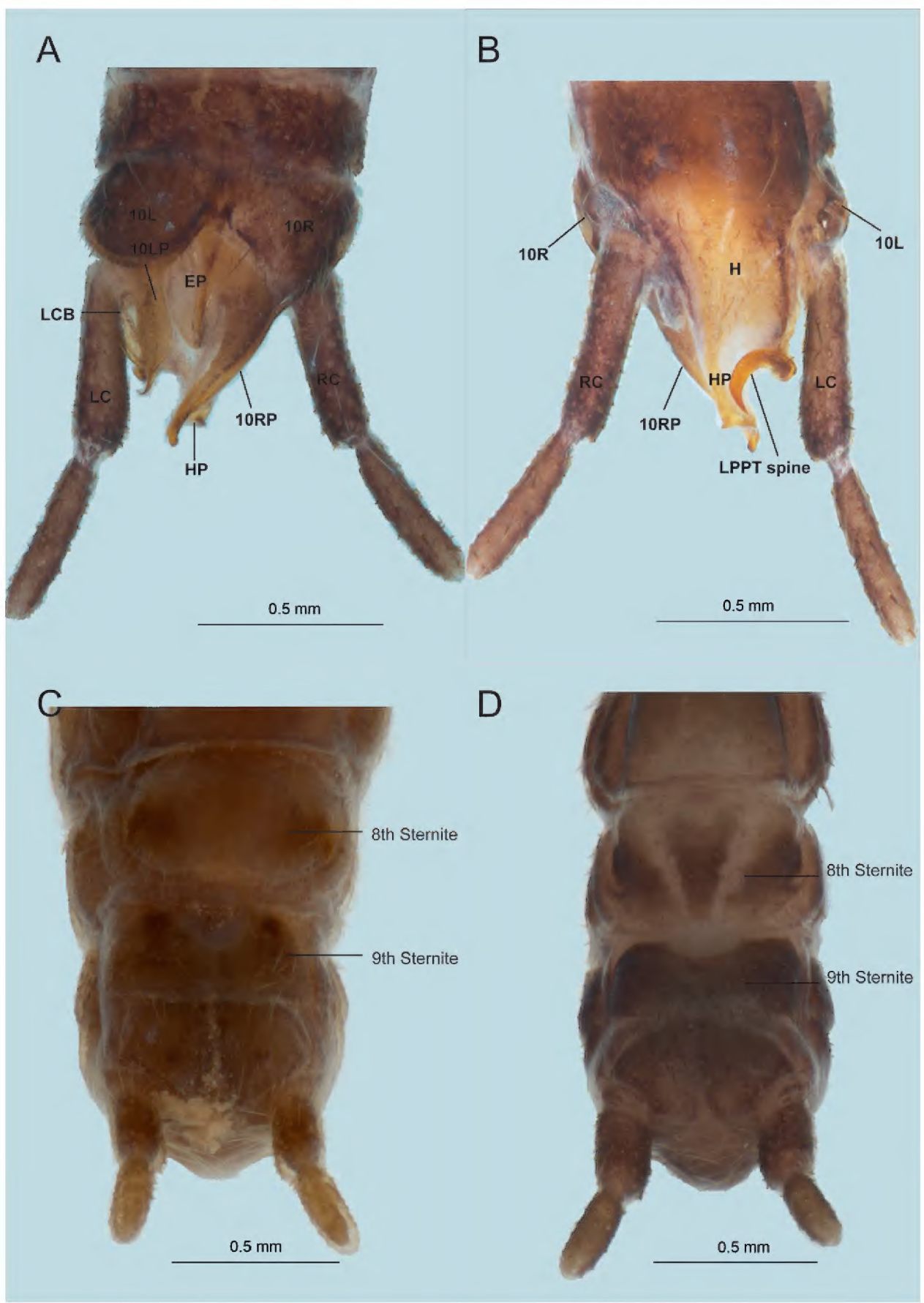

Fig. 5. Diagnostic characters of males and females. *Oligotoma saundersii* (**A, B, D**) and *O. nigra* (C). **A, B.** Dorsal and ventral views of terminalia of *O. saundersii* (♂) **C.** Ventral views of terminalia of *O. nigra* (♀). **D.** Ventral views of terminalia of *O. saundersii* (♀). 10L: left hemitergite, 10LP: Process of left hemitergite, 10R: right hemitergite, 10RP: Process of right hemitergite, EP: Epiproct, H: hypoandrium, HP: Process of Hypandrium, LC: left cercus, LCB: left cercus basipodite, LPPT spine: Spine (process) of left paraproct, RC: right cercus.

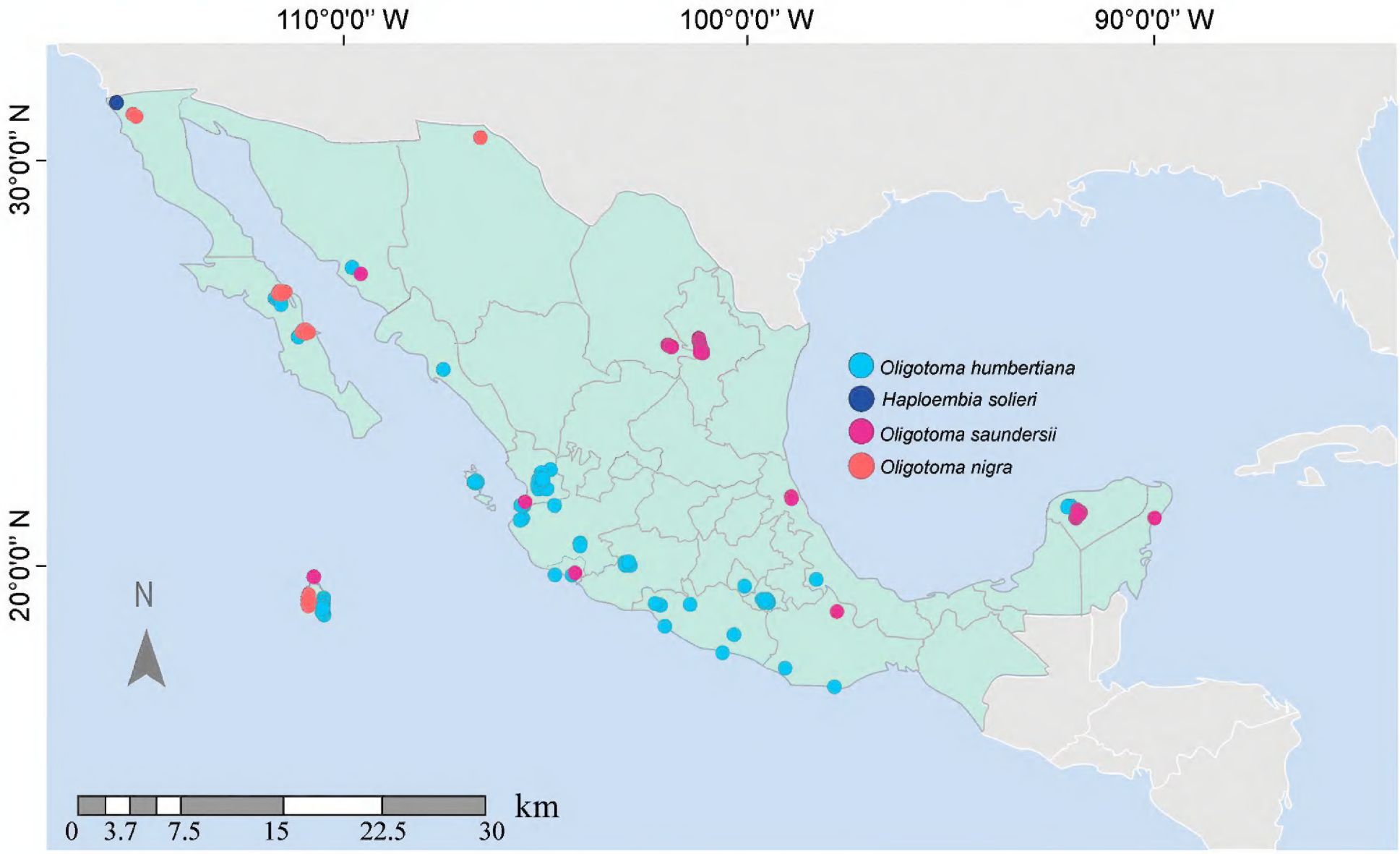

Fig. 6. Map of Mexico showing the records of the introduced Oligotomidae.

Discussion

Mariño and Márquez (1982) registered the presence of *O. humbertiana* in Central and Southwestern Mexico, specifically in the states of Guerrero, Jalisco, and Puebla. The new records presented here extend the species' known distribution to Baja California Sur, Ciudad de México, Colima, Guerrero, Michoacán, Nayarit, Oaxaca, Sinaloa, Sonora, Veracruz, and Yucatán, indicating a broader range across several regions of Mexico (Fig. 6). *Oligotoma nigra* was previously recorded by Ross (1957, 1966) in the extreme northwest (Baja California); here, it is newly recorded for the states of Baja California Sur and Chihuahua, which also belong to Northwestern Mexico (Fig. 6). Similarly, *O. saundersii*, previously reported in Campeche and Puebla by Mariño and Márquez (1982), is now newly recorded in Coahuila, Colima, Nayarit, Nuevo León, Oaxaca, Sonora, Veracruz, and Yucatán. As with *O. humbertiana*, this species is now confirmed to occur across several regions of the country, suggesting a broad and possibly underestimated distribution (Fig. 5). It is unknown whether these new records are the result of colonization within the last 40 years (since Mariño and Márquez 1982) or if the species were already widespread by the 1980s, with the limited records reflecting the difficulty of collecting and identifying these insects, compounded by the lack of interest among entomologists. Based on this first revision of the family Oligotomidae, we put forth that it is important to explore the national records of the order Embioptera, thus extending the revision of the group to other national insect collections with the objective of clarifying the distribution in the country and around the world, with the possibility of attributing it to a biogeographical pattern. We also argue that such exploration is important for understanding the potential impact of the colonization of these introduced species on the local species of embiopterans in Mexico.

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